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SNPO-C

REON

REPORT NO. P-TR-0001

PEGEBUS-2 NOZZLE

TENTATIVE FINAL QUALITY PROGRAM PLAN

May 1965

Contract SNPC-35

FOREWORD

This Tentative Final Quality Program Plan is published by the Product Assurance Division in partial fulfillment of Task G of Contract SNPC-35.

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LIST OF FIGURES

REFERENCE DOCUMENTS

The document numbers listed below, both AGC and government, are referenced in the Program Plan sections as indicated, provide operational details and will be submitted to the resident SMPO-C representatives for information upon request.

Section	Reference Documents
I	None
II	Drawing Change Notice (Form AGC 2-424) Advance Drawing Change Notice (Form AGC 4-574-1) Assembly Parts List (Form AGC 2-741-1) Basic Parts List (Form AGC 2-327) MSOM Fabrication Ordering Form (AGC 2-846)
III	None
IV	QCI 11-1-15A
V	Suppliers Discrepancy Action Request (Form AGC 00-009-030) Purchase Order Attachment B (Form AGC 86-132) Purchase Requisition (Form AGC 2-514) Purchase Order (Form AGC 2-515) SPI-K-06-18-0, QCS K-1-6, QCS K-1-1, QP 3-4-1, QP 15-1-10, QCS K-1-5, SPI-K-06-26-0
VI	None
VII	Interplant Work Authorization (Form AGC 00-009-022) QP to be released
VIII	Inspection Report (Form AGC 2-784) Notice of Discrepancy Tag (Form AGC 3-109-356) QCS K-1-4, QP 15-1-10
IX	SPI K-7-29-1, QCI 2-1, QCI 2-1-3c, QCI 2-1-6a
X	QCI 16-1-1e
XI	Shipping Instructions (Form AGC 0-14-4-8) Form LQ250 Modified (Form AGC 2-711) QP 18-1-(x) to be released, QCI 18-1
XII	MIL-STD 105 & 414, Handbooks H-106, 107, 108
XIII	QCI 11-1-3c
XIV	QP 15-1-10
XV	None
XVI	QCI 12-1-5f

I. INTRODUCTION

A. GENERAL (Ref. Para. 1.1)

1. This Program Plan describes the work that is to be accomplished at the Sacramento Plant of the Aerojet-General Corporation to assure compliance with the quality requirements of the Phoebus-2 Program under NASA Contract SNPC-35. Where sections of NASA document NPC 200-2 apply to this Program Plan, those applicable sections have been referenced in parentheses following the paragraph heading to which it applies.

2. Applicable documents concerning the control of quality are referenced in various sections of the program plan. As Phoebus-2 program needs dictate, these documents may be revised with concurrence of the Manager, REOM Product Assurance Division. Where the referenced documents conflict with the provisions of this program plan, the program plan will take precedence.

B. APPLICABILITY (Ref. Para. 1.2)

1. This program plan represents the interpretation of NPC 200-2, April 1962 Edition, for application at the Sacramento Plant under Contract SNPC-35. Application of the program plan provisions will be in accordance with the contractual work statement.

C. RELATION TO DETAIL REQUIREMENTS (Ref. Para. 1.3)

To eliminate duplication of efforts, the results of work performed to satisfy portions of the SNPC-35 contract requirements may be used to satisfy quality requirements. Should conflict occur between this program plan and SNPC-35 contract provisions, the contract provisions will apply. Compliance with the provisions of this program plan will constitute satisfactory compliance with SNPC-35 program quality requirements at the Sacramento Plant.

D. RELATION TO RELIABILITY REQUIREMENTS (Ref. Para. 1.4)

The Phoebus Reliability Program Plan complements but does not duplicate this Quality Program Plan.

E. GOVERNMENT QUALITY ASSURANCE ACTIONS (Ref. Para. 1.5)

The various items of work and work results of this program plan may be reviewed and inspected by SNPO-C representatives as required.

F. REVISIONS (Ref. Para. 1.6)

Revisions that may occur to NPC 200-2, April 1962 Edition, which affect schedules, contract scope or costs will not be mandatory for incorporation in this program plan until coordinated with the Phoebus and Product Assurance Division Managers and contract negotiations are completed between Aerojet-General Corporation and SNPO-C. Revisions that do not affect schedules, contract scope or costs will be accommodated to the extent possible. Changes to the provisions of the program plan will be as approved by the RESM Program Manager, the RESM Product Assurance Division Manager, the Phoebus Division Manager and the SNPO-C Technical Director. Revised Quality Program Plans, incorporating all changes to that current date, will be reproduced and distributed by RESM Product Assurance Division.

II. BASIC REQUIREMENTS

A. QUALITY PROGRAM DOCUMENTATION (Ref. Paras. 2.1 & 2.2)

The NERVA Product Assurance Division and Support Operations-Quality Control, with support as required of other NERVA and Sacramento Plant organizations, will provide quality documentation as required by this program plan. Such documentation will be available for NERVA-2 approval, review or information, as discussed below:

1. Approval

In addition to this Quality Program Plan the documents submitted for initial approval will include End Item Test Plans (Paragraph VII-B.3), and the End Item Test and Inspection Procedures (Paragraph VII-B.3). End Items are defined in Section VII-B.2.

2. Review

Test and inspection procedures (Paragraph VII-A & C) made available for review will include existing and new NCI documents concerned with the quality control of Phoebus-2 component testing, fabrication, and procurement including functional and acceptance test of the components. Process control procedures (Paragraph VII-E.4) in present use, including new ones as developed, results of evaluations of special inspection and test equipment (Paragraph IX-C), the Narrative End Item Report (Paragraph XIV-B.4), storage and handling procedures for end items (Paragraph XI-A), and sampling plans (Paragraph XII-A), as applicable to inspection of fabricated or purchase articles, will be available for review. Any changes requested as a result of the above review that affects schedules, contract scope or cost, will be implemented only after contract negotiations between AGC and SNPO-C.

3. Information

Documents submitted for information will include the Phoebus-2 Reliability and Quality Assurance input to the weekly TWX Status Report to the

II.A.3 (continued

Monthly Progress Report, and to the Quarterly Status Report. These reports will be submitted to SNPO-C by the Phoebus Division Manager's office.

B. CHANGE CONTROL (Ref. Para. 2.3)

1. General

A configuration identification and control system will be maintained for Phoebus-2 components and the related documents. The objective of the change control system will be to:

a. Provide a system for identification of Phoebus-2 components and related documents by:

(1) Name

(2) Serialization and/or log number, as applicable

(3) Engineering drawing, or specification number, and change letter.

b. Provide a system for controlling and documenting changes to configuration of Phoebus-2 components and the related documents.

2. Change Classification

a. Class I Change

Class I change control shall be required for components and documentation when the following items are affected:

(1) Safety

(2) Model Specification or contract specification requirements.

(3) Fit, function or interchangeability of installation or performance.

(4) Reliability

(5) Interfaces with associated contractors' products

(6) Retrofit

(7) Weight or center-of-gravity

II.B.2 (continued)

b. Class II Changes

All other changes shall be classified as Class II Changes.

c. Change Effectivity

Class I and II changes will be implemented by initiation of the Drawing Change Notice, Form AGC 2-424. Class I changes will comply with the standard provisions of the AGC Drafting Room Manual (DRM), including approval by Phoebus R & QA Dept. Class II changes will be approved by the cognizant Phoebus Engineering Department and by Phoebus R & QA Dept. as a minimum. Class II changes shall apply to all effected Phoebus components and related documents. The Class II change effective date shall include consideration of the availability of the changed hardware and documentation and of schedules or contract consideration approved by REON. For all Class I changes, a new dash number or new part number shall be assigned to affected hardware and documentation. For Class II changes, a new dash number or part number may be assigned to affected hardware and documentation.

3. Documentation

a. Drawings

The Drawing Change Notice (DCN) or the Advanced Drawing Change Notice (ADCN), will be the initiating document to affect a design change. This in turn may authorize change to the Fabrication Order, Basic Parts List (BPL), Assembly Parts List (APL), Procurement Requisitions, Shop Orders, or integrated fabrication planning. Each of these documents will reference the part number plus the revision letter. The procedure for using the DCN or ADCN will be as specified in the DRM. The Phoebus R & QA Dept. will signature approve all DCN's and ADCN's. The change classification will be identified in the Drawing Number Block.

II.B (continued)

b. Parts List

A BPL for each major assembly or subassembly for the latest official configuration shall be prepared, maintained and distributed by the Phoebus Nozzle Design and Development Department. The Phoebus R & QA Dept. will approve all issues of the BPL to assure the configuration represents the latest quality requirements of the Phoebus-2 program. The parts list will include the following information:

(1) Drawing title

(2) Part number

(3) Number of parts required

(4) Drawing release date

(5) Latest drawing change letter

c. Fabrication

The REON Fabrication Ordering Form, Form,AGC 2-846, will be the controlling document for all fabrication and procurement, and will be issued by the cognizant Phoebus engineers. Fabrication Orders for procurement and fabrication of end items (Section VII-D) will be identified as such. Configuration will be specified.

(1) The REON Manufacturing Control Department will use drawings, specifications and the IPI as authorized by the REON Fabrication Order, to prepare an APL and integrated shop and inspection planning. The Phoebus R & QA Dept. will approve the integrated shop and inspection planning.

(2) Pertinent documents and revision letters will be referenced on the integrated shop and inspection planning and related document, for changes made prior to fabrication. Obsolete documents will be pulled by the REON Manufacturing Control Department and the revised documents will be inserted into the shop traveler package as necessary. Changes to in-process integrated

II.B (continued)

shop and inspection planning will be approved by the RIDM Manufacturing Control Department and by the Phoebus R & QA Dept.

(3) The applicable Inspection Department-Support Operations will inspect and certify the configuration of the Phoebus-2 component that has been fabricated and tested.

c. Procurement

The Purchase Order will be the controlling document for all procured articles. Procurement quality assurance procedures are included in Section V. Purchase requisitions and purchase orders will be reviewed for quality assurance provisions and approved by Phoebus R & QA Dept. prior to release.

d. Testing

The Test Request and Test Request Supplement released by cognizant Phoebus engineers will be the authorizing document for conducting tests on Phoebus-2 components in the Test Area. Test Requests and Test Request Supplements will include by reference, approved test plans and test specifications. The test plans, specifications and requests will be approved by Phoebus R & QA Dept.

C. HARDWARE DEFINITION

The phrase "Phoebus-2 component", as it appears in this program plan, refers to the Phoebus nozzle assembly, or any of the assembly's component parts including non-deliverable in-house AGC hardware, deliverable non-end item hardware, or End Items.

End Item hardware is included within the end use Category "A" of Figure II-1. A specific definition of End Items and a list of the End Items are shown in Paragraph VII-D. Other hardware supporting the Phoebus-2 nozzle is defined and discussed in Sections IV-A.1, V-B.2.a, VII-D.5, VII-E.1, and IX-C.

II.C (continued)

All procurement fabrication, assembly test and quality documents will include designation of the end use category (Figure II-1) by the cognizant Phoebus Nozzle Design and Development Department and concurrent approval by Phoebus R & A Dept. Changes to the end use category will be accomplished in accordance with Sections VII-D.5 and VII-D.6. Quality engineering and inspection planning requirements as established by the Phoebus R & A Dept., shall be compatible with the end use category.

D. HARDWARE INTERFACE CONTROL.

1. General

Interface control is limited to interface between nozzles furnished by AGC which mate with hardware furnished by other contractors or sub-contractors for the purpose of Phoebus-2 reactor ground and hydro tests. AGC recognizes the primary responsibility for interface control belongs to LASL. The dimensions involved include the following areas: The nozzle-pressure vessel, nozzle-reflector cylinder, nozzle-propellant line, and instrumentation interfaces.

2. Documentation

Interface control documentation requirements will be specified as follows:

a. Interface Directives

Interface directives are issued in memorandum form by the Interface Control Committee (see Paragraph 3 below) to formalize interface decisions and to define responsibilities of contractors.

b. Interface Control Drawing (ICD)

This is a LASL drawing approved by the Interface Control Committee which defines the contributory responsibilities of the contractors participating in the interfacing hardware fabrication.

II.D (continued)

c. Approvals

Interface control drawings and memoranda will be signed by the Interface Control Committee members affected by the dimensions included in the documents before being accepted by AGC, unless waivered by the Phoebus Division Manager.

3. Interface Control Committee

The Phoebus Interface Control Committee will have complete and exclusive control of all interface requirements, documentation and changes, as set forth below:

a. The committee will consist of the following representation:

(1) LASL: Project Engineer

(2) Aerojet: Project Engineer

(3) ACPI: Project Engineer

b. The chairman of the Interface Control Committee will be the LASL Project Engineer. The chairman will be responsible for establishing dates of regular and/or special meetings, for notifying other members of such meetings, and for the coordination, recording and control of the transactions of the meeting.

c. The responsibility for assuring that interface requirements are defined within the AGC organization on AGC drawings and planning documents is assigned to Product Assurance Division.

d. The Committee will formalize those detailed procedures, rules and regulations, forms and operating details necessary to define and control the working interfaces.

4. Interface Control Gages

Requirements for Interface Control Gages to measure interface control dimensions will be established by the appropriate contractors and approved

II.D (continued)

by the LASL Project Engineer. The interface control drawings or specifications will include detailed direction for use of the gages, change control, cleanliness, preservation, packaging handling and shipping, inspection and inspection record requirements, and security as applicable. Type 1 or Type 2 drawings for AGC Interface Control Gages, or their equivalent, will be approved by Product Assurance.

5. Implementation

Interface control requirements will be specified on the AGC component or assembly drawing by appropriate flagging of all dimensions under the scope of the Interface Control Document. The flagged dimensions will be related to a drawing note which references the ICD and explains in detail the interface control documentation requirements for all such characteristics. Such characteristics on the drawing may not be changed without prior approved change to the ICD, as per Paragraph 2 above.

a. During AGC drawing review (Section IV-A.2.b) Phoebus R & QA Dept. will assure that the AGC drawings to which deliverable nozzles are fabricated are compatible with the approved ICD, and that documentation requirements for interface characteristics are properly defined. This will include the definition of recording requirements for attributes or variables inspection as agreed upon by the ICD Committee.

b. Fabrication and/or procurement documents for deliverable nozzles will be reviewed by Phoebus R & QA for incorporation of instructions and procedures for compilation of ICD documentation requirements.

c. The Narrative End Item Report (Section XIV-B.4) for nozzles for shipment to Nuclear Rocket Development Station (NRDS), will be reviewed by Phoebus R & QA for recording of all data required by the ICD documentation requirements on Figure VII-1.

Figure II-1

DIRECT CHARGE HARDWARE AND MATERIAL END USE CLASSIFICATION

END USE CATEGORY	GENERAL DESCRIPTION OF MATERIALS OR ITEMS
"A" Deliverable End Item or Component thereof, except Aerospace Ground Equipment	All raw materials, purchased parts, services, and/or sub-assemblies (major and minor) used to fabricate the item(s) being produced for the contract requirements. This includes prototypes and "test only" engines.
"B" Development or Evaluation Materials and Services	All Development or Evaluation materials and services consumed in the performance of a contract. All mock-ups would be included in this category.
"C" Approved Facilities Equipment	All items which retain their individual identity as a separate and severable unit even though they may be interconnected with other items of equipment or systems. These items are generally used in conjunction with other items, or pieces of equipment and systems, but are removable as a unit for use in other installations for different applications. A contract proposal reference is required for all items in this category.
"D" Special Test Equipment	All items which lose their individual identity as a separate and severable unit when they are interconnected with other items of equipment or systems. These items are generally used in conjunction with other items, or pieces of equipment and systems, but are not removable as a unit for use in other installations for different applications. A contract proposal reference is required for all items in this category.

III. MANAGEMENT

A. PLANNING (Ref. Para. 3.1)

Policy and requirements for quality on the Phoebus program are established by the Manager, REON Product Assurance Division. The authority of the Product Assurance Division for executing the various reliability and quality assurance tasks described in this section for the Phoebus project is derived from the REOn Vice President and Manager, as shown in Figure III-1. Phoebus Reliability and Quality Assurance is a department in the REON Product Assurance Division, whose authority and responsibility is to implement reliability and quality assurance requirements on the Phoebus-2 program within the scope of the contract work statement.

B. ORGANIZATION (Ref Para. 3.2)

The organization of the support operations activities concerned with the Phoebus program is shown in Figure III-2. The Test Organization of the Liquid Rocket Operations is shown in Figure III-3. REON Product Assurance Division, reference Figure III-4 has the responsibility for coordination and surveillance of the quality activities of these organizations in fulfilling the requirements set forth in this program plan, and for completion of tasks stipulated in this program plan.

Rocket Engine Operations
Nuclear Organization Chart

To be Prepared

Figure III-1
Page III-2

Figure III-2

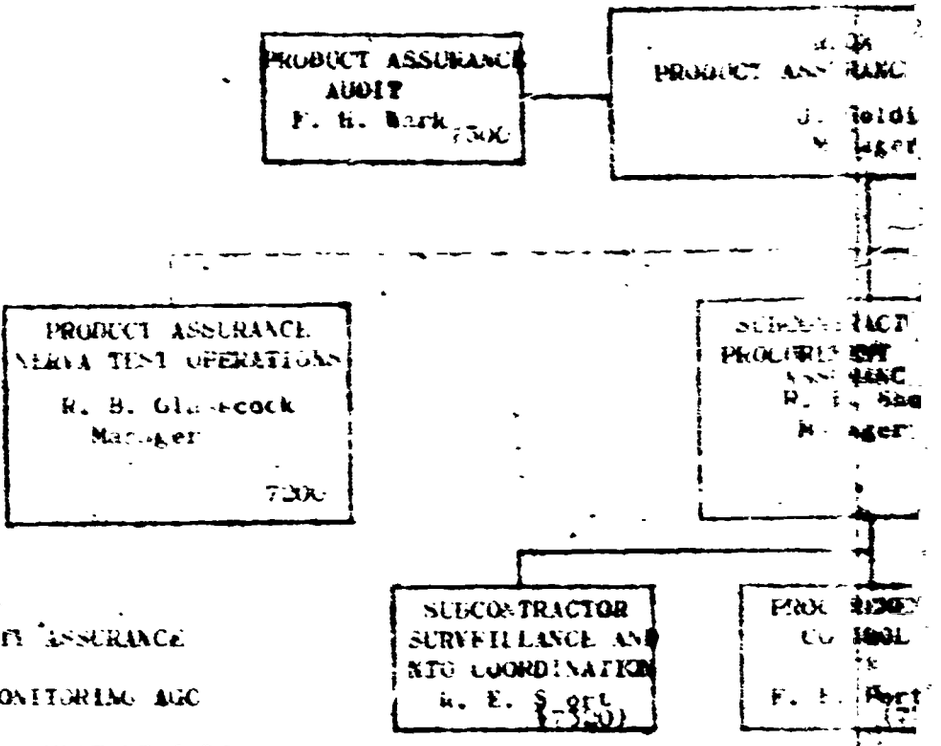
Sacramento Plant Quality Control
Organization Chart

To Be Prepared

Figure XVI-3

Liquid Rocket Operations
Test Organization Chart

To Be Prepared



AUDIT FUNCTIONS

1. EVALUATE EFFECTIVENESS OF QUALITY ASSURANCE SYSTEM FOR NERVA PROGRAMS.
2. ESTABLISH AUDIT SCHEDULES FOR MONITORING AGC AND ITS MAJOR SUBCONTRACTORS.
3. PREPARE AUDIT PLANS AND MAINTAIN AUDIT RECORDS.
4. EVALUATE FINDINGS AND FOLLOW UP FOR CORRECTIVE ACTION.
5. ESTABLISH AND MAINTAIN AGC AND SUBCONTRACTOR RATINGS AND ASSESS TRENDS.

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1. INSPECT TEST ARTICLES AT RECEIVING, DURING ASSEMBLY, AND AFTER DISASSEMBLY.
2. CALIBRATE AND CONTROL NTO TOOLS, GAGES AND TEST EQUIPMENT.
3. AUDIT SUBCONTRACTOR QUALITY CONTROL ACTIVITIES AT NTO.
4. REVIEW NTO PURCHASE REQUISITIONS TO INCORPORATE QUALITY CONTROL REQUIREMENTS.
5. CONTROL AND IMPLEMENT DISPOSITION OF NONCONFORMING HARDWARE AT NTO.
6. MONITOR PREPARATION OF NTO FAILURE SUMMARY REPORTS AND ASSIST UPDATING AND MAINTENANCE OF NSIR.
7. REVIEW, APPROVE AND MONITOR NTO TEST HARDWARE RECEIVING, ASSEMBLY AND DISASSEMBLY PROCEDURES AND PROCEDURE CHANGES.

SUBCONTRACTOR SURVEILLANCE AND NTO COORDINATION

1. APPROVE PRODUCT ASSURANCE PLANS FOR AGC AND MAJOR SUBCONTRACTORS.
2. CONDUCT SURVEILLANCE OF QUALITY AND RELIABILITY ASSURANCE ACTIVITIES AT MAJOR SUBCONTRACTORS.
3. ASSURE IMPLEMENTATION AND EVALUATE EFFECTIVENESS OF CORRECTIVE ACTION TAKEN BY MAJOR SUBCONTRACTORS.
4. PROVIDE SOURCE SURVEILLANCE FOR CRITICAL NERVA COMPONENTS AS DIRECTED.

COORDINATE PRODUCT ASSURANCE ACTIVITIES BETWEEN AGC PRODUCT ASSURANCE AND NTO INCLUDING APPROVAL OF NUCLEAR SYSTEM TEST PLANS AND TEST SPECIFICATIONS.

6. REVIEW AND APPROVE ALL PROCUREMENT PACKAGES SUBMITTED TO SNPO-C.

PROCUREMENT CONTROL

1. DEFINE QA PROVISIONS FOR PO TEMS, AND APPROVE PURCHASE
2. DEFINE REQUIREMENTS FOR RECEIVING INSPECTION PLANS
3. RESPONSIBLE FOR SOURCE AWARD EVALUATION OF SUPPLIERS
4. ASSURE CERTIFICATION SUPPLIERS IS PERFORMED IN PROGRAM REQUIREMENTS.
5. INITIATE REQUEST FOR C EVALUATE EFFECTIVENESS
6. PARTICIPATE IN REVIEW AND END ITEM REVIEW OF DRAWINGS
7. REVIEW OF PROCESS AND ACC

PRODUCT ASSURANCE ENGINEERING

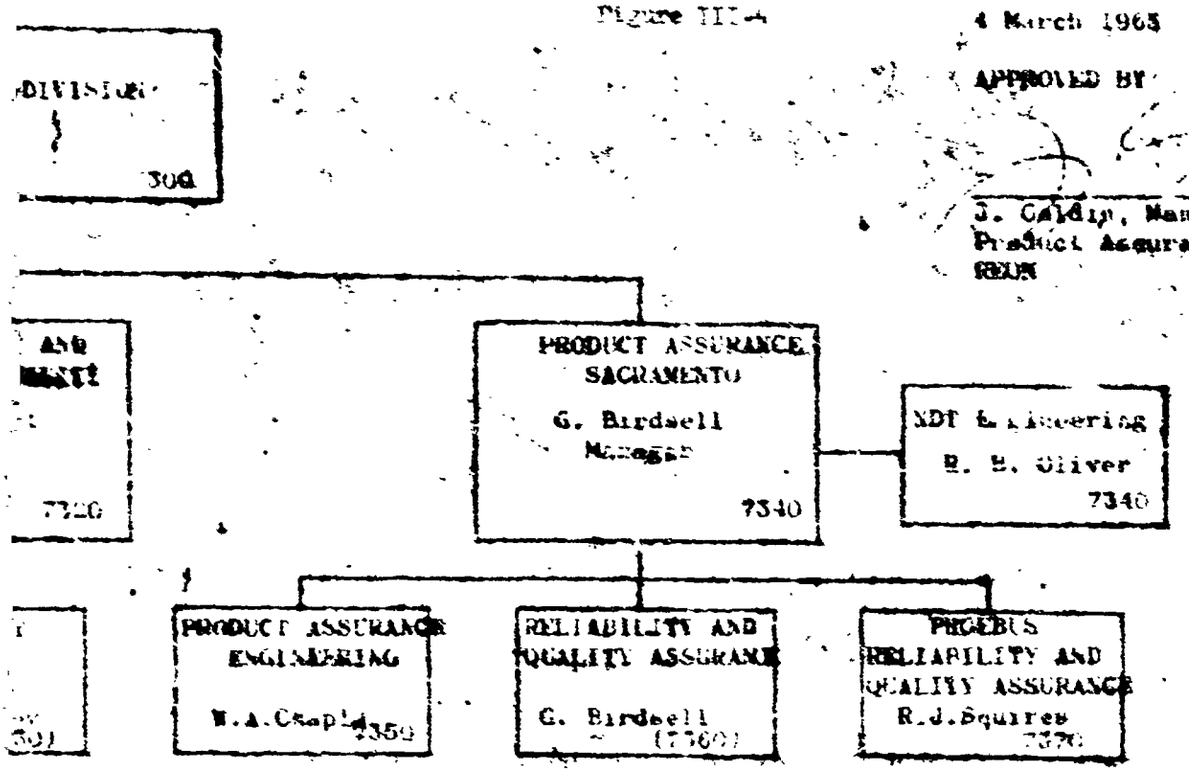
1. REVIEW AND APPROVE DRAWINGS
2. DEFINE QUALITY REQUIREMENTS
3. REVIEW AND APPROVE PROCESS INSPECTION PLANNING
4. PARTICIPATE IN ENGINEERING REVIEWS AND E.O ITEM REVIEWS.
5. ASSURE LABELING AND IDENTIFICATION
6. REVIEW AND APPROVE PLANNED (ICD) DRAWINGS AND SPECIFICATIONS
7. EVALUATE ADEQUACY OF MATERIAL.

Figure III-4

4 March 1965

APPROVED BY:

J. Caldin, Manager
Product Assurance Division
RBUN



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RELIABILITY AND QUALITY ASSURANCE

1. PREPARE BUDGETS AND PROPOSAL INPUTS, MONITOR COSTS AND ISSUE QUARTERLY REPORTS.
2. ACCUMULATE, ANALYZE AND MAINTAIN RECORDS OF PARTS PERFORMANCE AND RELIABILITY.
3. ASSURE COMPLETE LOGS AND RECORDS FOR RBUN HARDWARE.
4. REVIEW TDO'S AND TEST REQUESTS, APPROVE TEST PLANS AND TEST SPECIFICATIONS FOR COMPONENT AND SUBSYSTEM TESTS.
5. PARTICIPATE IN ENGINEERING REVIEW, MATERIAL REVIEW, AND END-ITEM REVIEW FOR SACRAMENTO TEST OPERATIONS.
6. PARTICIPATE IN FAILURE ANALYSIS AND ASSURE TIMELY AND EFFECTIVE CORRECTIVE ACTION.

PHOEBUS RELIABILITY AND QUALITY ASSURANCE

1. PREPARE AND MAINTAIN RELIABILITY AND QUALITY ASSURANCE PROGRAM PLANS AND DEFINE RELIABILITY AND QUALITY REQUIREMENTS.
2. REVIEW AND APPROVE DRAWINGS, SPECIFICATIONS, TEST PLANS AND TEST SPECIFICATIONS, INTEGRATED FABRICATION AND INSPECTION PLANNING, AND PROCUREMENT DOCUMENTS.
3. MONITOR HARDWARE FABRICATION, ASSEMBLY AND TESTING AT THE SACRAMENTO PLANT AND COORDINATE SURVEILLANCE OF QUALITY AND RELIABILITY ASSURANCE ACTIVITIES AT SUBCONTRACTORS.
4. PARTICIPATE IN ENGINEERING AND MATERIAL REVIEW BOARD ACTION AND ASSURE EFFECTIVE CORRECTIVE ACTION AND FAILURE ANALYSIS.
5. ASSURE MAINTENANCE OF QUALITY AND RELIABILITY DATA AND REPORT PREPARATION.
6. COORDINATE BUDGET PREPARATION AND MONITOR COSTS.

2

IV. DESIGN AND DEVELOPMENT CONTROL

A. DRAWING AND SPECIFICATION REVIEW (Ref. Para. 4.2)

1. General

Drawings, specifications, and supporting technical documents that will control Phoebus-2 component fabrication and procurement will be reviewed prior to release by Phoebus R & QA Dept. to assure that product quality requirements are incorporated. Drawing level will be a minimum of Type 1 as defined in the DRM. Classification of characteristics will be included in accordance with standard DRM procedures. Control requirements for material handling equipment, tooling and SSE are presented in Section IX.

Engineering sketches (Type C drawings) will not be used for the procurement or fabrication of Phoebus-2 components. However, Phoebus engineering department may use sketches (Type C drawings) for describing experimental, development, or evaluation work on such Phoebus-2 components or material in the engineering laboratories and for procurement and/or fabrication of test specimens for laboratory analysis. Phoebus R & QA will review and approve such sketches for quality requirements.

Before the start of such experimental, development, or evaluation work, the cognizant Phoebus department will arrange for applicable Quality Control-Support Operations Inspection Department to stamp or identify the Phoebus-2 component or material with a conditional use (square) stamp (Section X). Such engineering sketches and associated engineering data (Section XIV-B.2) will be recorded and filed by part number in the engineering laboratories. Phoebus R & QA will monitor such laboratory work and records for compliance with quality requirements.

Such experimental or development Phoebus-2 components or material, as described in whole or in part by engineering sketches, will not be used for any purpose outside the engineering laboratories. In the event that Phoebus-2 laboratory

IV.A (continued)

components are required for any use outside the engineering laboratories, Type 1 drawings and associated specifications will be generated from the engineering sketches and data. New Phoebus-2 components will be procured or fabricated for such use, if the laboratory components cannot be upgraded to the desired end use category in accordance with the provisions of Section VII-D.

2. Drawing and Specification Review Procedure

a. All Type 1 drawings will have Product Assurance signature block completed, indicating approval of Phoebus R & QA Dept. prior to release for fabrication or procurement. The drawing review procedure outlined below complements but does not duplicate the formal design review procedure, which is a part of the Phoebus Reliability Program Plan. The purpose of the drawing review is to monitor completion of Formal Design Review action items and to assure adequate design disclosure of quality requirements.

b. Prior to a drawing release, the Phoebus Nozzle Design and Development Department will forward check prints to Phoebus R & QA for the purposes of quality review. Phoebus R & QA will review the drawings and mark up as necessary, using a red pencil for mandatory changes, blue pencil for recommended changes and a yellow pencil for acceptable characteristics. When the drawing is acceptable to Phoebus R & QA the Product Assurance drawing title block will be signed and dated indicating approval. Government drawings, specifications and technical documents that support Phoebus quality requirements will be reviewed and applied as required during the drawing review by Phoebus R & QA.

c. Specifications for Phoebus-2 components will be reviewed and approved by Phoebus R & QA for inclusion of applicable quality requirements. Approval will be by signature, as a part of the specification, or on the Document Approval Signature Sheet (Form A3C 00-100-003) that accompanies the specification during the approval sequence. See Section IX-C for equipment specifications for Special Test Equipment.

IV.B (continued)

B. QUALIFICATION TESTS (Ref. Para. 4.3)

1. The qualification test requirements are considered as incorporated in the contract task entitled "Development, Proof and Acceptance Test Methods". The nozzle development, proof and acceptance test methods will be submitted as part of the engineering program documents. Development test methods will be prepared and testing performed on components for chemical testing, as stipulated in the engineering program documents.

2. The Qualification Status List, referenced in NPC 200-2, as such, will not be maintained. The specific Phoebus-2 nozzle configuration to be delivered will be described by the Phoebus engineering program documents which includes the Basic Parts List, AGC drawings and specifications, test plans and test specifications. Such documents and the supporting acceptance tests will meet the applicable provisions of this program plan.

C. IDENTIFICATION (Ref. Para. 4.4)

Requirements for serialization or lot control for each part or component will be defined on released type 1 drawings. Identification numbers for parts or components will be consistent with the engineering drawing and the change control systems. Basic, component and assembly parts lists will be marked to indicate items requiring serialization or lot control.

1. Serialization

a. Control of material subject to serialization will be in accordance with the applicable QCI.

b. The following categories of items will require permanent serialization:

(1) Complex or functional assemblies.

(2) Assemblies containing one or more serialized or lot controlled items.

IV-C (continued)

(3) Items that require unique data on function or operation to be recorded.

(4) Items that are subject to time and cycle limitations, functional checks, calibrations, periodic servicing, or other forms of operation for which scheduled maintenance or replacement is established.

(5) Items that require functional acceptance testing as provided by specification or requirements given on the drawing.

(6) All End Items

2. Lot Control

a. A lot is defined as a collection of units of products manufactured and supplied as a unit. However, when more than one heat or batch of material is represented in such a collection of units, a lot shall be confined to all units of one heat or batch. In the case of standard parts and supplier proprietary items, a lot may be defined as the total of material received at one time.

b. Control of material subject to lot control will be in accordance with the applicable QCI.

V. CONTROL OF CONTRACTOR-PROCURED MATERIAL

A. SELECTION OF PROCUREMENT SOURCES (Ref. Para. 5.2 and 5.3)

1. General

A minimum of Type 1 drawings will be used in the procurement of all material and equipment with the exception of the material and equipment specified in Sections V-B.2 and IX C. Phoebus R & QA Dept. will assure that applicable provisions of this program plan are implemented in all procurements and subcontracts for materials and products to be used on the Phoebus-2 program and that optimum use is made of available AGC corporate, Sacramento Plant and MSOB-P&D personnel in performing quality assurance tasks. Purchase Orders shall incorporate requirements for subcontractors and their sub-tier contractors compliance with the applicable provisions of the Phoebus-2 R & QA Program Plan. Procurement sources for engine development hardware will be selected from the AGC Corporate Evaluated Supplier's List In the event that the proposed procurement source is not on the Evaluated Supplier's List, Phoebus R & QA and Phoebus Nozzle Design and Development Department will participate with the Procurement and Material Division, ELCS Product Assurance Division and other AGC organizations as required in the evaluation of the proposed supplier as described in Paragraph V.1. Procurement sources for special test equipment will be selected from the AGC Corporate Evaluated Supplier's List or the LRC Test Division Equipment Qualification Status Sheet. In the event that the proposed procurement sources are not listed, Phoebus R & QA Dept. will participate with other AGC organizations as required in the evaluation of the proposed supplier.

Occasionally suppliers of commercial off-the-shelf items are not listed in the Evaluated Supplier's List [illegible]. When Phoebus Engineering and Phoebus R & QA considers it advantageous to limit the selection of suppliers of such off-the-shelf items, the suggested sources will be listed on the purchase requisition. Commercial supplier's quality performance history will be periodically

V.A (continued)

reviewed by Phoebus R & QA. Suppliers consistently furnishing deficient or unsatisfactory commercial materials will not be considered in the placing of future purchase orders. The Procurement and Materiel Division will minimize purchases from distributors and will favor direct purchases from the original manufacturer.

2. Records (Ref. Para. 5.2)

Quality Control-Support Operations will maintain detailed records of supplier's quality performance history. For MSOM procurements, these records will be compiled and published monthly for cognizant Sacramento Plant and MSOM personnel. Suppliers with consistently unsatisfactory records and who have been unable to effect corrective actions may be designated as unsatisfactory for additional contracts on the Phoebus-2 program, by Management, Phoebus Nozzle Design and Development Department and Phoebus R & QA. Such action will be coordinated with Procurement and Materiel Division-Support Operations, MSOM Product Assurance Division, and Quality Control-Support Operations to determine action to be taken relative to the supplier's position on the ASL.

B. PROCUREMENT DOCUMENTS (Ref. Para. 5.3)

Requisitions for Phoebus-2 materials will be processed through MSOM Product Assurance Division for review, approval and recording.

1. Procurement documents will contain the following information:

a. Technical Requirements (Ref. Para. 5.3.1.2)

Pertinent Type 1 or Type 2 drawings, specifications, test and inspection requirements, source or Sacramento Plant acceptance requirements special process requirements and other quality criteria as required will be designated as part of, and will accompany, the purchase order. Use of Supplier's Discrepancy Action Request (SDAR), Form ACC 00-009-030, will be specified as applicable.

V.B (continued)

b. Documentation Requirements from Suppliers

Reliability and quality assurance provisions, including documentation requirements which are not set forth on the face of applicable drawings or in reference specifications shall be incorporated by reference to the designated numbered clauses listed on the purchase order Attachment "F", Form AEC 86-132. When necessary to define provisions significant to the program, special clauses will be incorporated.

c. Supplier Quality Program (Ref. Para. 4.3.1d)

Purchase orders for other than commercial or off-the-shelf items will require compliance with AGC Supplier Inspection System Provisions, QCS M-1-6, unless specific exceptions are authorized by Phoebus R & QA. Any changes to QCS M-1-6 that affects Phoebus-2 procurement will be subject to RECW Product Assurance Division approval and coordination with Phoebus R & QA prior to implementation. As applicable, purchase orders will require submission for approval prior to implementation of factory inspection test plans, special process procedures and techniques, nondestructive testing procedures and techniques, drawings, specifications, and functional or end item test plans. Approval will be provided by Phoebus engineering and Phoebus R & QA, or this responsibility may be delegated. Administration and controls for assuring that approvals are obtained is the responsibility of Procurement and Material Control Division-Support Operations and RECW Product Assurance Division. Approval of supplier inspection planning is the responsibility of AGC supplier quality representatives, who shall incorporate the AGC control points necessary to assure product conformance.

2. Purchase Document Requirements (Ref. Para. 5.3)

All Purchase Requisitions, Form AGC 2-514, shall be reviewed by Product Assurance Division for adequacy of work statement in compliance to the Phoebus R & QA plan, for end use requirements, and to incorporate quality assurance

V.B (continued)

provisions consistent with such requirements. Purchase Order, Form AOC 2-515, shall be reviewed by RSOM Product Assurance Division and approved for compliance with the purchase requisition, required supplier approvals and conformance to any special Phoebus-2 program requirements. For procurements processed through the ANTHON Division (Section IX-C), Phoebus R & QA will perform or delegate all Phoebus-ANTHON coordination, RSOM-Product Assurance Division Procurement Control will maintain purchase order records and provide quality assurance service on contractual matters as may be required. Copies of purchase orders, when released, will be supplied to Quality Control-Support Operations for preparation of detailed receiving inspection planning. Such planning will be approved by RSOM-PAD prior to use and will be utilized by Quality Control-Support Operations Receiving Inspection for inspection of the received material. Copies of purchase orders, when released will be supplied to RSOM-PAD and Quality Control-Support Operations.

The requirements of Paragraph B.1 above, when applied to feasibility study hardware or hardware for design evaluation purposes, may be modified by work statement on the purchase requisition by the cognizant Phoebus-2 engineering department. These modifications will be subject to approval by Phoebus R & QA and, as a minimum, shall include the following:

a. Components will be fabricated to a specific part number (may be supplier's part number) plus those modifications required to accomplish the functional and acceptance test requirements. Those modifications may be described by drawing or specification and will be identified in the procurement document.

b. Provide documentation of those characteristics that would affect functional and/or acceptance test requirements.

c Provide revised drawings with the hardware showing the as-built configuration. Part number shall reflect any modifications by change letter or number.

V.B (continued)

d Upgrading of used hardware to end item configuration will be in accordance with the provisions of Section VII-3.5.

C. RECEIVING INSPECTION PLANNING

Receiving Inspection planning shall be prepared by SSOM Product Assurance to supplement the quality assurance provisions set forth on the purchase order and the source surveillance and source verification performed by AOC Supplier Quality Representatives at the source manufacturer. Special instructions, when necessary, will be furnished the Supplier Quality Representative consistent with program, product and end use requirements. Distribution and planning will be performed by Quality Control-Support Operations. The Receiving Inspection planning will be adequate to permit individual distribution planning of Receiving Inspection Instructions (RII). If the product or inspection method complexity warrants, Product Inspection Instructions (PII) will be prepared.

D. SUPPLIER QUALITY CONTROL PROCEDURES (Ref. Para. 5.4 and 5.5)

When assigned to provide surveillance and verification, the AOC Supplier Quality Representative shall operate in conformance to purchase document requirements as directed by [illegible] Product Assurance Division, to implement the Phoebus R & QA plan. Product discrepancies or purchase order deviations shall be documented on Supplier Discrepancy Action Request (SDAR), Form AOC 00-009-030, by the supplier. Approvals of Phoebus engineering and Phoebus R & QA will be indicated on the SDAR.

E. RECEIVING AND INSPECTION

1. Receiving and inspection instructions will specify criteria required for receiving inspection. Receiving inspection will be performed by the applicable Inspection Department.

V.E (continued)

2. Any sampling performed as allowed by purchase documents, shall be in accordance with Standard Military Sampling plans as defined in Section XII of this program plan.

3. Nonconforming materials will be segregated and the discrepancy described on the Inspection Report (IR), Form AGC 2-784, and processed in accordance with Section VIII. The corrective action procedure for nonconforming subcontractor materials shall insure effective action consistent with the Phoebus program requirements.

4. Copies of certifications, laboratory results and inspection records of the parts and materials which becomes a part of the serialized assembly or the serialized component of the serialized assembly, shall be forwarded to the NRDS Documentation Control Center designated by Phoebus R & QA. These records will be available for review and reproduction at the NRDS Documentation Control Center.

F. RECEIPT OF MATERIAL FROM NRDS

The Receiving and Inspection Department of Quality Control-Support Operations will process material received from NRDS in accordance with the shipping instructions. The Phoebus-2 engineering department and Phoebus R & QA Dept. will be advised of receipt of the material and will provide direction for further processing. Discrepancies will be dispositioned in accordance with Section VIII.

G. DIRECT SHIPMENTS TO NRDS

1. End Item material to be shipped directly from suppliers to NRDS shall be accepted by Phoebus R & QA, or designee, at source prior to shipment.

2. Source acceptance shall be performed in accordance with criteria stated in Paragraph C above, except that material will not be shipped to NRDS until released by MRB/ERB through the cognizant purchasing agent.

V.G (continued)

3. Acceptance documentation, certification and other supplier originated evidence of quality shall be forwarded by the source quality representative to Procurement and Material Division-Support Operations for clearance of receiving records and incorporation into MEIR reports prior to MRR/ERB actions.

4. Direct shipments of non-end item material will require acceptance by the REON Source Quality Representative at the source prior to shipment as authorized by the purchase document.

H. IDENTIFICATION

1. Purchase orders will specify lot control or serialization, if required by the drawings, and provide the numerical serial sequence, location and designated method to be used. Acceptance tags will be attached to received material and will be identified to the receiving documents during the receiving inspection operation. Section VII-E of this program plan contains detailed material control identification requirements.

I. APPROVED SUPPLIER'S LIST (Ref. Para. 5.9 and 5.10)

1. The Procurement and Material Division will maintain an Evaluated Supplier's List, based on the appraisal of suppliers production capabilities and business background. Phoebus engineering and Phoebus R & QA will participate with other cognizant AGC organizations as required in the evaluation of suppliers whose capabilities may be utilized for the Phoebus-2 program.

2. REON Product Assurance Division will review and approve additions to, and deletions from, Evaluated Supplier's Lists after consideration of the following factors:

a. The supplier's quality performance history, as reflected in the cumulative three months rejection rate on REON material as well as other shipments of material delivered to the Sacramento Plant.

b. Performance history in terms of the particular type of work for which the supplier is being considered.

V.I (continued)

c. A review of the vendors quality plan to determine conformance to the requirements of QCI's and of his ability to take proper corrective action for deficiencies.

3. Certification of suppliers for special processes to be performed on Phoebus-2 components shall be conducted in accordance with applicable QCI's and QP's.

4. Evaluated Suppliers' lists for current R&D Procurement, including special processes for which they are qualified, will be maintained by the Procurement and Material Division-Support Operations.

VI. CONTROL OF GOVERNMENT FURNISHED PROPERTY

A. INSPECTION OF GOVERNMENT FURNISHED PROPERTY (Ref. Para. 6.1)

1. Receiving Inspection will be performed on all Government Furnished Property (GFP) by the applicable Inspection Department of Quality Control-Support Operations for accountability and evidence of transit damage, and for conformance to Government shipping documents.

2. The Inspection Department will assure that GFP being furnished to the ASC user is properly identified, packaged and preserved, and that records of inspection are prepared, processed and stored.

3. GFP will be functionally tested in accordance with requirements of transmittal or engineering documents prior to release for ASC use.

B. [redacted] (Ref. Para. 6.2)

Discrepancies found in GFP shall be noted on ASC Inspection Reports and disposition recommendations will be provided by [redacted] numbers for use by the furnishing Government Agency, which will make the final disposition through an authorized government representative.

VII. CONTROL OF CONTRACTOR-FABRICATED ARTICLES

A GENERAL (Ref Para. 7.1)

All Phoebus-2 components (Section II-C) will be fabricated to a minimum of Type 1 released drawings with the exception of items specified in Sections VII-B and IX-C. Integrated Shop Planning and Inspection Planning shall be provided and will be contained in a sequentially organized document for each part number in accordance with the applicable quality procedure. Shop and Manufacturing planning will be provided by the cognizant Manufacturing Engineering Department. Inspection planning will be provided and/or approved by Phoebus Reliability and Quality Assurance for Phoebus-2 components and other supporting hardware as required (Section II-C). Quality Control-Support Operations will inspect the quality of fabrication, assembly and test operations from inception of manufacturing through static firing, functional testing, and shipping in accordance with integrated planning requirements. Final inspection of End Items and witnessing of Final Acceptance Tests of End Items will be performed by the applicable Inspection Department.

B. CONFORMANCE CRITERIA (Ref. Para. 7.2)

Applicable Type 1 released drawings, together with Shop, Inspection, and Test Planning documents will be assembled into a single shop traveler packet that will accompany the Phoebus-2 component, and other supporting hardware (Section II-C), through all phases of fabrication, assembly and test. These documents will provide the conformance criteria for the appropriate hardware, including End Item and Narrative End Item Report requirements, as applicable, (see Sections VII-D and XIV-B.2). Feasibility study or design evaluation materials and hardware may be fabricated to other than Type 1 or Type 2 drawings. For such items the Phoebus Reliability & Quality Assurance will approve all planning documents and specify quality assurance requirements as required by the specific evaluation being performed.

C. INSPECTION AND TEST PLANNING (Ref. Para. 7.3)

Inspection and test plans describing the inspection and test processes through the phases of fabrication, assembly and stores will be developed and maintained. All quality planning input will be approved by Phoebus Reliability and Quality Assurance which shall be responsible for specifying quality requirements in the fabrication, assembly, and testing.

1. Inspection and Test Procedures (Ref. Para. 7.3.1)

Inspection instructions for fabrication and assembly inspection and test operations will be prepared by Phoebus Reliability and Quality Assurance and will be designed to provide guidance to personnel responsible for the inspection and testing of Phoebus hardware and related materials. These instructions will include inspection and nondestructive testing criteria as follows, and will be based on the end-use category defined in the planning:

a. Characteristics to be observed, measurements to be recorded, and parameters that determine acceptance or rejection.

b. Special inspection techniques or processes.

c. Special instructions for documentation of inspection and test results, and the recording of variables data, as required.

d. For Interface Control Dimensions, the recording of Inspection Data (Figure VII-1) as required by drawings, and the use of specified Interface gages, if required.

2. Types of Planning

The various types of quality planning to be used are:

a. Shop Order Planning

Integrated shop and inspection planning instructions for fabrication and assembly operations will be provided after review of drawings, specifications, and manufacturing planning, and will include, by reference or

attachment, the applicable HTI, ETI, PII and authorized changes discussed below. The End-Use Category (Figure II-1) will be identified on the shop and inspection planning documents. These instructions will be designed to provide assurance that material will be adequately inspected at appropriate processing points.

b. Hydro Test Instruction

Hydro Test Instructions (HTI) will describe the techniques and acceptance parameters for pressure and leak testing. Phoebus Reliability and Quality Assurance will review and approve the HTI planning for conformance to quality requirements.

c. Electrical Test Instructions

Electrical Test Instructions (ETI) will be prepared by the cognizant Inspection Department, will be reviewed and approved for quality requirements by Phoebus Reliability and Quality Assurance, and will describe the necessary procedures for the checkout and inspection of electrical devices.

d. Product Inspections Instructions (PII)

PII's may be utilized in emergency situations to supplement the integrated shop and inspection planning document and will be included in the planning packet. Such PII's will be prepared by Phoebus Reliability and Quality Assurance.

e. Changes

Required changes to approved integrated planning, HTI's, ETI's, or PII's and other documentation required to implement fabrication, assembly or test, will be reviewed and approved by Phoebus Reliability and Quality Assurance prior to implementation. Evidence of approval will be in the form of an Inspection Planning Stamp. The reason for any change will be documented on the planning.

D. INSPECTION AND TEST PERFORMANCE (Ref Para. 7.4)

Quality Control-Support Operations shall provide all inspection services required by integrated planning documents. Nonconforming items will be recorded on IR forms, and made available for determination of cause, corrective action and disposition, in accordance with the requirements of Sections VIII and XIV.

1 In-Process Inspection (Ref Para 7.4.1)

In-process inspection will be conducted at points in the fabrication or assembly process as defined by integrated planning documents, and in all cases will be before or at the last point in the operation where the acceptability or quality of the operations can be determined. Certification of personnel affecting quality will be in accordance with Section XIII. Each inspection operation will be validated with the inspector's stamp, as designated by integrated planning documents.

2 End Item Final Acceptance Test & Final Inspection (Ref. Para.7.4.2)

End Items are defined as: "All major components or parts of the Phoebus-2 nozzle which will be fabricated, assembled or tested at Sacramento Plant and which will be shipped from Sacramento Plant for installation in/or on Phoebus-2 reactors." These End Items for AGC are as follows.

a. Phoebus-2 Nozzle Assembly

b. Component parts of the above system or assemblies, Paragraph 2.a above, and spare parts, may be shipped individually for possible replacement and/or installation on the above end items. . . .

(1) Separate Narrative End-Item Reports (NER) (Section XIV-B 4) are not required for these parts. However, the documentation accompanying these parts shall be such that when the part is installed on the End Item, the part documentation may be inserted in the NEIR for that End Item. Such NEIR will then fully describe the End Item.

3. End-Item Final Acceptance Test Plan and Final Inspection Plan

a Test Plans

Prior to the completion of assembly of an End Item, an End-Item Test Plan will be prepared by Phoebus engineering with Phoebus Reliability and Quality Assurance review and approval. End Item Test Plans will receive SNPO-C approval prior to beginning final acceptance test and final inspection. The Test Plan will describe the Final Acceptance Tests and Final Inspection for the End Item, will provide proof of substantial contract conformance, the acceptability for intended end use and readiness for shipment. The Test Plan will include a complete technical description of the End Item, the parameters to be inspected or tested with the applicable nominal and tolerance values, and the sequence of the tests or inspections to be performed. Phoebus Nozzle Design and Development will prepare required Test Specifications and Test Requests (see Section XVI) which define the test performance and criteria for End Items. The Phoebus Reliability and Quality Assurance will prepare the required inspection plans for End Items.

b Test and Inspections

Final Acceptance Tests and Final Inspections will be witnessed by Quality Control-Support Operations. Significant unplanned events

that occur during the Final Acceptance Test and the Final Inspection will be documented on the IR by Quality Control-Support Operations, for Engineering Review Board (ERB) action (as described in Paragraph VIII-B. Such ERB action will become a part of the Narrative End-Item Report (NEIR).

4. Documents and Records

a. A Shop Traveler packet (a three-ring pressboard binder) will be provided by the RFTN Manufacturing Control Department, which will be used to hold copies of shop and inspection planning documents, evidence of inspection, buildup records, and discrepancy records and will move with the hardware from station to station. The packet documentation will show the present part number, with authorized changes as may occur during buildup of the assembly. The Inspection supervision, cognizant of the hardware at the various points of manufacture, assembly or test, shall be responsible for the completeness of the records in the Shop Traveler packet. No person shall be permitted to remove documents from the Shop Traveler packet without express consent from the cognizant Inspection supervision. Shop Traveler packets for End Items will be conspicuously identified to the End Item by name, part number and serial number.

b. Upon completion of the final acceptance test or final acceptance inspection of an End Item, Quality Control-Support Operations shall determine that all documentation is in order and that Acceptance Stamps are affixed. Six (6) copies of the NEIR will be prepared under the direction of Phoebus Reliability and Quality Assurance Department as per the format and content shown in Section XIV-B.4

c. [illegible] Reliability and Quality Assurance and Phoebus Engineering will review the NEIR for adequacy prior to submittal to SNPO-C.

d. Phoebus R & QA, Phoebus Engineering and SNPO-C shall conduct Material Review Action (or End Item Review Board action if no discrepancies exist) on the End Item. Quality Control-Support Operations shall act in an advisory capacity to the Material Review Board.

e. Upon acceptance of the End Item and MRIR all members of the End Item Review Board action shall sign the certification sheet in the MRIR, designating acceptance of the End Item.

f. Upon completion of item (e) above, the Shop Traveler and supporting documentation and one (1) copy of the MRIR shall be retained by Quality Control-Support Operations, who shall arrange for permanent storage and maintenance.

g. Upon completion of Final Acceptance Tests and Final Inspection, no modifications, repairs or replacements will be made prior to shipment without full MRB action as described in Paragraph VIII-B.

h. Quality Control-Support Operations will assure that all End Item document and record requirements are met prior to release of the End Item for shipment from Secremento Plant.

5. Up-Grading of Hardware to End Item Category

Items of hardware procured or fabricated for feasibility study or design evaluation, other than End Item or Category A (Figure II-5), may be up-graded to End Item or Category A level, providing the following criteria are met:

a. A released drawing(s) as provided by the cognizant Phoebus engineering department which specifies the configuration.

b. Documentation can be produced to prove that the hardware configuration meets the drawing. Those characteristics which would affect acceptance test, functional or critical dimensional requirements must be attested to by an inspection stamp or the signature of the cognizant Phoebus engineering

department Manager, with Phoebus R & QA Dept. concurrence.

c. Supplier certifications of special processes, materials, and related documentation, with RECN verifications as required, shall be available for review.

d. Objective evidence of meeting the acceptance test and functional requirements shall be produced. An inspection stamp or the signature of the cognizant Phoebus engineering department Manager, with Phoebus R & QA concurrence, shall attest to this.

e. An IR shall be initiated, stating that the purpose of the IR is to up-grade to Category A, identifying for the above Items a through d, those items which are discrepant or missing. This IR shall be submitted for MPI action (Section VIII), the successful completion of which will allow the hardware to be identified as an End Item.

6. Downgrading of Hardware

Downgrading or changing the Category (Section II-C) of hardware or material will be initiated by the IR and dispositioned in accordance with Section VIII.

B. FABRICATION CONTROLS (Ref. Para 7.5)

1. Production Tooling and Fabrication Equipment

Production tooling, jigs, fixtures, and other fabrication equipment which control final dimensions and contours will be purchased, fabricated and controlled under the direction of RECN Manufacturing Control Department as follows:

a. Each tool will be identified with the following information:

(1) Tool Number

(2) Serial Number, when required

(3) Tool drawing change letter

(4) Contract Number

b. Quality Control-Support Operations will:

(1) Inspect tooling for conformance to the tool drawing prior to use.

(2) Initiate a Tool Inspection History Card.

(3) Inspect tooling after rework or modification, or at any time the tool produces defective material.

(4) Maintain records of all inspections of tooling by Tool Number and by Part Number.

c. In-Process (Floor) Inspection will:

(1) Inspect first article produced by new tooling or reworked tooling.

(2) Place a Hold Tag on tooling producing a discrepant part, and remove Hold Tag when tooling has been reworked, and an acceptable first article has been inspected.

2. Material Control (Ref. Para. 7.5.2)

a. Identification

Materials and articles that are procured or fabricated will be identified by a part number, a serial number or lot number when required by Type 1 released drawings, or by specifications.

b. Material requiring lot control will be identified and processed in accordance with integrated planning instructions which will assure traceability of documentation by the applicable lot number.

c. Material requiring serialization will be identified and processed in accordance with the applicable QCI.

d. Material or hardware ordered for feasibility studies or design qualifications shall be identified by sub-subtask, and the purchase requisition, purchase order, IM or shop order and associated planning documents shall be stamped or noted as feasibility study or design qualification, and the end use

category (Section II-C) defined. The specific inspection and documentation requirements shall be called out on these documents by the Phoebus R & QA Dept., with Quality Control-Support Operations to provide inspection to assure compliance.

e. Nonconforming Material

Nonconforming material will be identified, withheld from further processing, and will be dispositioned in accordance with Section VIII.

f. Articles with Limited Shelf or Use Life

End Items (Paragraph VII-D) having quality deterioration through age or use, and as required by Type 1 or Type 2 drawings, will be marked to identify the start of the useful life, the time or cycles, and the duration of the useful life, time or cycles remaining, and such data will be included on inspection records. Fabrication, quality, and test planning documents will so identify the End Items to be marked. The MRIR will record the remaining useful life, time or cycles of the End Items shipped.

g. Control of Fired or Tested Hardware at Sacramento Plant

Control of hardware into the test area, pre-fire, post-fire, and removal from the test area shall conform to applicable provisions of Section XVI.

When fired hardware is removed from the Test Area, the IR will be initiated by cognizant test area Inspection personnel for disposition by the cognizant Phoebus engineer. The fired hardware will be received and held in the controlled area identified on the IR until a disposition has been made. Hardware will be inspected and the parts returned for storage or rework. Nonconforming material will be processed as specified in Section VIII.

h. Control of Hardware Returned from NRDS

Hardware or material returned from NRDS to Sacramento Plant will be received by the Quality Control-Support Operations Receiving Inspection

Dept. and inspected as required by the Shipping Instructions. Inspection planning instructions will be supplied as required by Phoebus R & QA Dept. The IR will be prepared as required by Quality Control-Support Operations for dispositioning nonconforming materials in accordance with the applicable provisions of Section VIII. Further processing of the hardware, not covered by the IR, will be initiated by the NSOS Fabrication Ordering Form.

3. Control of Cleanliness of Fabrication and Test Spaces (Ref. Para. 7.5.3)

Required cleanliness levels for fabrication, assembly, and test areas will be defined on Type 1 or Type 2 released drawings by specifications, planning documents, or in special process procedures. Quality Control-Support Operations will perform the inspections required to assure compliance.

4. Process Control (Ref. Para. 7.5.4)

Special processes will be approved or certified for compliance to applicable specifications which describe each process by the Quality Engineering Department of Quality Control-Support Operations. Equipment and personnel responsible for nondestructive testing, such as radiography, ultrasonic inspection, and penetrant inspection, will be specially trained and certified by qualified examiners (Section XIII), and records of such certification will be maintained by Quality Control-Support Operations. Nondestructive testing will be performed in accordance with Type 1 released drawing requirements and by applicable specifications, quality control inspection planning and quality control standards.

F. INTERPLANT WORK AUTHORIZATIONS

Quality Control requirements for work at AGC plants, other than Sacramento, will be designated on an Interplant Work Authorization (IWA), form AGC 00-009-022. Requirements for quality will be specified in each IWA and indicated by Phoebus R & QA signature approval. Such requirements will provide for compliance with all applicable portions of this plan.

Figur 'II-1

NAME_____

PART NO._____ S/N_____

AGC DWG NO._____ REV_____

_____ REV_____

_____ REV_____

ICD DWG NO._____ REV_____

_____ REV_____

PROPOSED
INTERFACE CONTROL DIMENSION RECORD

DATE_____

Page 1 of _____

Item	ICD Dwg No._____ Zone	Characteristic	Component Dwg No._____ Zone	Characteristic	Temp	Supplier Inspection Record Measure.	Method	Seq.	AGC Inspection Results Measure	Method

VIII. NONCONFORMING MATERIALS

A. DEFINITION

Nonconforming material shall be defined as any material, part or product on which one or more characteristics does not conform to requirements specified in the contract, specification, drawing or other applicable product description.

B. ENGINEERING REVIEW/MATERIAL REVIEW/END ITEM REVIEW

1. An Engineering Review Board shall be established by the Manager, NERVA Product Assurance Division to determine the disposition of all nonconforming material on the Phoebus-2 program not subject to Material or End Item Review. The Engineering Review Board shall be composed of representatives from Phoebus R & QA Department and Phoebus engineering. Nominations for Phoebus engineering members of the board shall be submitted by Phoebus Division Management to the Manager, NERVA Product Assurance. Copies of dispositioned Inspection Reports (IR's) will be promptly distributed to all cognizant organizations by Quality Control-Support Operations. Decisions and dispositions regarding acceptability of discrepancies, as identified and documented by Quality Control-Support Operations, will be made jointly by Phoebus engineering and Phoebus R & QA Department in accordance with the provisions of the applicable Q.P. The IR will include definition of the cause and corrective action related to the discrepancy. The Phoebus R & QA Department will assure implementation of the corrective action to be taken by the organization cognizant of the cause.

2. A Material Review Board shall be established by the Manager, NERVA Product Assurance Division to determine the disposition of nonconforming material applicable to End Item or Category A (Fig. II-1) hardware, as defined in Section VIII-D.2. The Material Review Board shall be composed of representatives

VIII,B ENGINEERING REVIEW/MATERIAL REVIEW/END ITEM REVIEW (cont'd)

from Phoebus engineering, Phoebus R & QA Department and SNPO-C. The Phoebus R & QA Department representative will act as chairman of the Material Review Board. Nominations for Phoebus engineering members of the Board shall be submitted by Phoebus Division Management to the Manager, Product Assurance Division-NERVA. The Material Review Board will convene when mutually agreed upon by the Phoebus R & QA Department and Phoebus engineering. The Phoebus R & QA Department will notify the SNPO-C Resident Quality Representative of the time, subject and place for convening of the Material Review Board.

3. An End Item Review Board shall be established by the Manager, NERVA Product Assurance Division, to perform the function of review of data and documentation (including MRB decisions) associated with End Items or Category A hardware, as defined in Section VII-D.2, to assure proof of compliance with contractual requirements and acceptability for shipment. The End Item Review Board shall be composed of representatives from Phoebus engineering, Phoebus R & QA Dept. and SNPO-C. The Phoebus R & QA Dept. representative will act as chairman of the End Item Review Board. The Board will convene when final inspection acceptance of the end item has been completed, or at any point in the processing of an end item component, sub-assembly or assembly, as mutually agreed upon by the Board. The decision of the Board will be documented on a certification document, and also by IR if so required by the Board, to be inserted in each Narrative End Item Report (NEIR) (Section XIV-B.4)

4. The Nonconforming Material Control Board (NMCB) is composed of the NERVA Product Assurance Division Manager, the NERVA Program Manager, and the SNPO-C Resident Quality Representative, and the designated alternate for each. This Board will be responsible for approving Material Review Procedures and members, assuring that adequate material review board records are maintained, periodic review of MRB decisions to evaluate their adequacy, and considering those unusual cases in which the complexity or the critical nature of the problem

VIII,B ENGINEERING REVIEW/MATERIAL REVIEW/END ITEM REVIEW (cont'd)

requires decisions by higher management.

5. Nonconforming material, with discrepancies beyond the scope of Material Review Board action, requiring contractual adjustment, shall be submitted to SEPO-C by the AGC Phoebus Contracting Officer for formal deviation approval (before-the-fact authorization to depart from requirements) or waiver (acceptance for use of an article not meeting specified requirements).

C. REPORTING, IDENTIFICATION AND PRELIMINARY DISPOSITION

1. Discrepancies detected in the Sacramento Plant will be recorded on an Inspection Report according to the applicable Q.P. The Suppliers Discrepancy Action Report (SDAR) will be initiated by suppliers for AGC consideration of nonconforming hardware deemed useable or repairable, according to instructions in the applicable QCS and dispositioned by ERB action.

2. Nonconforming material will be identified upon initiation of the IR by use of the appropriate tag as determined by the Inspection Supervisor or Phoebus R & QA Department ERB member, according to the applicable Q.P.

3. Preliminary disposition of nonconformances will be made by Phoebus R & QA department Review Board Members. The scope of preliminary dispositions is confined to:

a. "Rework", which is defined as reprocessing or continuing processing so as to make the hardware conform to drawings, specification and contract requirements.

b. "Review", which commits the nonconforming hardware to ERB/MRB for final disposition. In order to minimize production down-time or processing delay that might be caused by removal of nonconforming hardware from processing, a preliminary "review" decision may be clarified in the Disposition/

VIII,B ENGINEERING REVIEW/MATERIAL REVIEW/END ITEM REVIEW (cont'd)

Comments block of the IR by the provision of authorization to continue fabrication to a specified stop point prior to submission to the ERB/MRB. Such action must be made or approved by the Phoebus R & QA Department Review Board member. Such nonconforming material will be identified by a Notice of Discrepancy Tag (AGC Form 3-109-356) and a determination of the stop point at which final disposition is to be made.

D. REVIEW BOARD DISPOSITION

Final Engineering Review/Material Review Board disposition will be governed by the operating rules of the applicable quality procedure. Decisions to "Reject" may only be made with the concurrence of a Phoebus engineering member of the Review Board. Final review dispositions will be made after the completion of corrective action statement on the IR, which may include a corrective action plan with a specified effectivity date or an explanation if corrective action is not required. Material dispositioned repair will be re-inspected and accepted following repair.

IX. INSPECTION, MEASURING, AND TEST EQUIPMENT

A. CALIBRATION (Ref. Para. 9.2)

The accuracy of all inspection, test and measuring equipment will be assured by the Measurement Standards Operations Department of Quality Control - Support Operations through the implementation of the applicable SPI and QCI's. The Sacramento Plant Calibration Program system and responsibilities are defined in the SPI, and details of procedure are delineated in the QCI's. A Primary Standards Laboratory that assures traceability of all calibrations to national standards in accordance with the applicable SPI is maintained.

B. EVALUATION (Ref. Para. 9.4)

Special inspection and test equipment for critical Phoebus hardware will be evaluated by the REON Product Assurance Division, the cognizant Phoebus engineering department and the organization charged with control and use of this equipment. These evaluations will determine the accuracy of the inspection and test equipment used for determining quality of hardware. Evaluation will determine the amount of specified product tolerance that will be occupied by the inspection and test equipment tolerance. Results of all evaluations will be documented by memorandum report, maintained in permanent files by the REON Product Assurance Division, and utilized as required in review of drawings, specifications, interface control documents and procurement documents.

C. SPECIAL TEST EQUIPMENT (STE)

Special Test Equipment procured for the test facility for the Phoebus program will be subject to the following provisions:

1. General Requirements

STE items for the Phoebus program will normally be procured through the AETRON Procurement Division, with technical direction and supervision by the Test Division. The quality assurance provisions will adhere to standard commercial practices on non-environmental hardware. The overall objective is to assure that the special test equipment will support the contract development and

IX, C.1. INSPECTION, MEASURING, AND TEST EQUIPMENT (cont'd)

acceptance testing program in such a manner that test objectives will be met.

2. Drawing and Specification

All STE drawings will be reviewed by Phoebus Reliability and Quality Assurance or designee for incorporation of adequate characteristics to assure the quality of the item and for provision of adequate criteria to judge the conformance to such characteristics. Subcontractor drawings submitted for AGC approval prior to implementation will be reviewed by Phoebus Reliability and Quality Assurance for compatibility with AGC system requirements and adequate quality assurance provisions. Phoebus Reliability and Quality Assurance will review all STE specifications and approval will be in the form of signature on the title page. The purpose of this review is to assure that the technical requirements section of the specification adequately defines the specific requirements for the item through the media of references to Equipment Specification Sheets and incorporation of applicable portions of the Phoebus Standard Component and Equipment Notes. Operating conditions, sizes, specific qualification tests and nondestructive tests (including operational testing, will be specified as required to assure delivery of a quality product.

3. Procurements

Procurement documents will be reviewed by the REON Product Assurance Division (Section V-B-2) and approved by signature on the Purchase Requisition. This review will be based on the approved drawings and specifications and assure that the procurement package incorporates adequate quality assurance provisions through the media of Equipment Specification Sheets, Phoebus Standard Component and Equipment Notes and application of Quality Control purchase order rider clauses as required. Procurement documents will define the AGC organization responsible for in-process inspection and final acceptance, and the geographical location of same.

IX, C.3. INSPECTION, MEASURING, AND TEST EQUIPMENT (cont'd)

In-process inspections and final acceptance, including supporting records and data, will be monitored by [redacted] Product Assurance Division for compliance to procurement document requirements. Discrepancies will be processed on the [redacted] and dispositioned in accordance with Section VIII.

X. INSPECTION STAMPS

CONTROL OF INSPECTION STAMPS (Ref. Para. 10.1)

The control of inspection stamps will be maintained through the implementation of the applicable QCI, which provides instructions for the use, control, procurement and maintenance of stamps and tags used to identify and indicate the quality status of materials, parts, assemblies and documents.

XI. PRESERVATION, PACKAGING, HANDLING, STORAGE AND SHIPPING

A. GENERAL (Ref. Para. 11.1)

The preservation, packaging, handling and storage procedures for protection of Phoebus hardware will be governed by the AGC Packaging and Material Handling Operating Procedure Manual and the applicable Q.P.

B. PRESERVATION, PACKAGING, HANDLING AND STORAGE

1. The general Manual provisions will be supplemented by the requirements of Phoebus drawings and specification, and in the event of conflict, the provisions of the drawings and specifications will govern.

2. Specific requirements will be incorporated by the inclusion in detailed integrated planning of specific instructions and of reference to Material Handling Instructions, Vendor Packaging Instructions and Packaging Information Forms. These instructions will provide control over:

a. Protective treatment of materials within the scope of the contract.

b. In-plant storage and handling of parts/assemblies.

c. Subcontractor packaging and preservation requirements.

d. Specific material handling equipment and procedures for in-plant use.

e. Preparation of materials and end items for shipment outside of the Sacramento plant.

3. Specific handling, packaging, and storage requirements for end items after delivery will be included in the MEIR, as applicable.

4. The Phoebus R & QA Department will review and approve preservation, packaging, handling and storage procedures prior to incorporation into planning requirements. Quality Control Support Operations will monitor conformance to these procedures during processing as specified on integrated planning documents.

C. SHIPPING (Ref. Para. 11.6)

1. Shipment of partially completed articles from the Sacramento Plant for fabrication, assembly or testing prior to completion will be governed by applicable Q.P. requirements.

2. Shipment of Phoebus-2 components from the Sacramento Plant for delivery under the contract will be processed in accordance with the applicable Q.P. Quality Control Support Operations personnel will assure that the items called out on the "Shipping Instructions" Form, AGC 0-14-4-8, have satisfactorily passed all applicable inspection and tests. The item will have an Acceptance Tag (AGC 00-052-009-1) as evidence of inspection, and will be preserved and packaged according to applicable requirements. The "Material Inspection and Receiving Report", Form DD-250, Modified, Form AGC 2-711, will be prepared and will call for inclusion of an MEIR as applicable.

XII. STATISTICAL PLANNING, ANALYSIS AND QUALITY CONTROL

A. SAMPLING PLANS (Ref. Para. 12.3)

Sampling conducted on Phoebus-2 components shall conform to the specific controlling procurement, drawing, specification, fabrication, assembly or test documents. Sampling Plans will be in conformance with applicable military standard sampling plans (e.t., from MIL-STD-105, MIL-STD-414 or Handbooks H-106, 107 and 108), and as specified by NPC 200-2, Section 12.3. Use of alternate sampling plans will be submitted to Phoebus R & QA Dept. for review and approval prior to implementation. All items of hardware accepted by sampling will be identified in the Quarterly Quality Status Report (Section XIV), provided by Quality Control Support Operations.

B. STATISTICAL QUALITY CONTROL CHARTS (Ref. Para. 12.4)

1. Statistical quality control charts will be used as required for the control of special processes. Quality Control Support Operations will review process control charts and initiate corrective action for discrepancies.

2. For processes where continuous recording is required, strip charts will be used for control of process quality.

3. Where a test is to be conducted on a time cycle such as an eight-hour batch test on a plating tank, the Test Referral will be used and maintained on file in that area.

4. Specific requirements for sampling plans, statistical Quality charts, continuous recording charts, and time cycle controls will be identified on purchase requisitions (Section V) or in-house (Section VII) integrated planning by Phoebus R & QA, with the Quality Control Support Operations to provide inspection for compliance.

XIII. TRAINING AND CERTIFICATION OF PERSONNEL

A. TRAINING (Ref. Para. 13.1)

As various training courses or seminars may be scheduled by Quality Control Support Operations, NRCM PAD will be formally advised of the course title, content and schedule, such that NRCM PAD personnel may be scheduled for attendance as required. Specific training courses for personnel directly charged and concerned with the work of Product Assurance and Inspection on the Phoebus Program at Sacramento Plant will be approved by NRCM PAD. Utilization will be made, to the extent feasible, of the instructional material and instructors available through the Personnel Development Department of the Industrial Relations Division, Sacramento Plant.

B. CERTIFICATION OF PROCESSES AND PERSONNEL

Processes and personnel performing special processes during Phoebus Program work at the Sacramento Plant will be certified in accordance with the applicable QCI. The Quality Improvement Department of the Quality Engineering Division of Quality Control Support Operations, will be responsible for the administration of the certification test program and compilation of certification status records. Certification of suppliers performing special processes will be in accordance with the applicable QCI.

XIV. DATA REPORTING AND CORRECTIVE ACTION

A. GENERAL (Ref. Para. 14.1)

A complete data system will be maintained to provide for collection and analysis of all trouble, failure, and quality data resulting from test, inspection, or use of articles procured or fabricated. Specific methods and procedures for corrective action on all reported deficiencies will be provided.

B. DATA REPORTING (Ref. Para. 14.2)

1. Monthly Quality Status Report (Ref. Para. 14.2.1)

The Monthly Quality Status Report requirement of NPC 200-2 will be met by the Phoebus R & QA input to the monthly progress report to be submitted under the contract, and the Quarterly Quality Status Report, which will be submitted by Phoebus R & QA to SNPO-C as a section of the regular Quarterly Letter Report from Phoebus Project to SNPO-C during the reporting period. Contributors to the Quarterly Status Report will be Quality Control Support Operations, and Phoebus R & QA, who shall combine the various inputs and arrange for publishing and distribution. The contributing report inputs will include highlights of audits performed, a list of vendor evaluations, and a narrative discussion of significant quality problems that have an effect on program schedule and technical progress, cost, and contract scope.

2. Laboratory and Experimental Data (Ref. Para. 14.2.2)

Data to be recorded and filed on laboratory testing of experimental, development, or evaluation hardware (Section IV-A.1) will include part numbers, purpose of test and test conditions, test results and records, failure analysis and reports as applicable. This data will be periodically reviewed for adequacy by the Phoebus R & QA Department. The IR system will not be used for laboratory experimental, development, or modification work that utilizes engineering sketches (Section IV-A.1). Records of all laboratory work on Phoebus-2 components described by Type 1 or 2 drawings will comply with the provisions of this Quality Program Plan, including use of the IR system.

XIV,B DATA REPORTING (cont'd)

3. Quality Data (Ref. Para. 14.2.3)

a. Drawings, specifications and procurement documents will be reviewed by the Phoebus R & QA Dept. for quality assurance provisions and will be summarized monthly in a tabulation of documents reviewed and status.

b. All Inspection Reports (IR), SDAR's and QMIR's will be reviewed on a monthly basis and analyzed from the standpoint of cause and corrective action documentation and results summarized by the Phoebus R & QA Dept.

c. Input from Receiving Inspection, fabrication, assembly and test inspection will be tabulated on a monthly basis and summary reports prepared indicating inspection activity. Trends will be evaluated by the Phoebus R & QA Department after comparison with rejection documents and interpretation.

d. Integrated planning documents, ETI's HTI's, Test Referrals, etc., will be periodically reviewed by Phoebus R & QA Dept. to assure that the records retained serve as objective evidence of inspection.

4. Narrative End Item Report (Ref. Para. 14.2.4)

Narrative End Item Reports will be prepared in accordance with the applicable Q.P. for all end items (Sect. VII-D-2), components or controls for end items to be shipped under the contract schedule. Prior to release of any of the above for shipment to the customer, the NEIR will be submitted to and approved by an End Item Review Board (Sect. VIII-B), composed of representatives from the following organizations:

Phoebus Nozzle Design and Development Department

Phoebus Reliability & Quality Assurance Department

SNPO-C, Resident Quality Representative

A copy of the approved NEIR will be included in the shipping documents.

XIV,B DATA REPORTING (cont'd)

a. The MEIR will define the end item, its configuration, nondestructive, pressure and acceptance tests performed and will include a summary of material review actions, corrective actions taken or pending, interface control dimension records, shipping and operating instructions as applicable.

b. On subcontracted or procured material subject to end item review, where shipment is to be made directly to the using agency, End Item Report requirements will be incorporated in the procurement documents. Shipment will normally be withheld until the MEIR has been submitted to and approved by the End Item Review Board.

The Quality Control log book, containing assembly and inspection records and supporting documentation will be retained by Documentation Control, Quality Control-Support Operations, and will be made available to the End Item Review Board upon request.

5. Operational Data (Ref. Para. 14.2.5)

The acquisition of operational and functional test data will be the responsibility of the various engineering and laboratory departments and the Test Division. Such test data will be reduced, analyzed, and reported in summary form by the specific cognizant engineering department responsible for such test. Reports of failures and malfunctions as documented on the IR (Sect. VIII) will be monitored by Phoebus R & QA to assure closed loops for any corrective action arising from failure analyses.

C. CORRECTIVE ACTION (Ref. Para. 14.3)

All discrepancies found during receiving inspection, fabrication, assembly or test at the Sacramento Plant will be reported on the IR by an inspector. Discrepancies found at subcontractors facilities will be reported on the SDAR. Discrepancies found at NRDS will be reported on the QRDR. The procedures for documenting corrective actions taken as a result of reported discrepancies will

XIV,B DATA REPORTING (cont'd)

be as defined in the applicable Q.P. Phoebus R & QA will be responsible for approval of corrective action plans and monitoring to assure that the loop is closed in a timely and effective manner.

XV. AUDIT OF QUALITY PROGRAM PERFORMANCE

PERFORMANCE OF AUDITS (Ref. Para. 15.1)

The results of audits performed under contract SNPC-35 will be reviewed by the Phoebus R & QA Dept. Any corrective actions necessary as a result of such audits will be evaluated for applicability to the Phoebus program and implementation achieved through the direction of Phoebus R & QA.

XVI. TEST AREA QUALITY CONTROL

A. GENERAL

1. The test area is defined as the Cryogenics Laboratory and other areas of the Liquid Rocket Operations Test Area used in support of Phoebus Test Activities.

2. Static and functional testing of Phoebus-2 components and related development hardware and supporting equipment in the Test Area is the responsibility of the Liquid Rocket Operations Test Division (Ref. Fig. III-4), under direction of Phoebus Division Manager.

3. Quality Engineering activities including Test Request and Test Specification review, area surveillance, HSE activities, test surveillance and data review are the responsibility of the Phoebus R & QA Dept.

4. Inspection planning incorporated in TDO's, inspection, and maintenance of records are the responsibility of the Quality Control-Support Operations and such activities will be conducted in accordance with the applicable QCI.

B. TEST REQUEST SYSTEM

The Test Request, the Test Request Supplement and Expedited Test Request Supplement describe the requirements and provide authorization for testing. These documents will be initiated by the cognizant Phoebus engineering department requesting preparation of the test facility, installation of hardware or equipment testing. These documents will be forwarded to the Phoebus R & QA Dept. for review and approval. The execution of the Test Request or other documents will be the responsibility of the LRO Test Division. The Aerojet Test Procedure-Test Division Operative (ATP-TDO), and Engine Test Directive (ETD) will be prepared by the initiating test engineer and submitted to the Phoebus R & QA Dept. for review and approval. This review will be for the purpose of providing assurance that the ATP-TDO and ETD comply with Test Plan, Test Specification and Test Requests

XVI,B TEST REQUEST SYSTEM (Cont'd)

requirements. Upon completion of testing the Test Engineer will prepare the Test Remarks Sheet, which will be the formal report to the requesting Phoebus engineering department and Phoebus R & QA Dept. of the test accomplished, including quality problems and significant inspection results, and will form a permanent record of the test. Copies will be provided to other departments as required.

C. PHOEBUS NOZZLE AND DEVELOPMENT HARDWARE CONTROL

The Inspection Department of Quality Control-Support Operations will perform visual inspection of engines and components upon receipt, during installation, pre-fire, post-fire, removal, decontamination, and preparation for shipment as required by the applicable planning document. This will include verification by stamp or signature on Quality Planning (ATP-TDO's) as required. Nonconforming material will be identified on an Inspection Report and dispositioned in accordance with the provisions of Section VIII. Removal of hardware from the Test Area will be authorized by a Test Request Supplement.

D. TEST STAND EQUIPMENT CONTROL

1. New Materials and Parts

Requisitions for procurement for test stand equipment will require the approval of the Phoebus Test Program Manager of the Test Division. The Phoebus R & QA Dept. will review and approve the drawings and specifications for such equipment and the Product Assurance Division will review and approve the procurement documents for such equipment in accordance with procedures established in Section IX-C and V-B-2 of this program plan.

2. Rework and/or Replacement of Test Stand Equipment

Rework and/or replacement of test stand equipment will be authorized by the Test Operations Division, who will provide for records and control over rework and/or replacement, acceptance criteria, and provisions for

XVI,D TEST STAND EQUIPMENT CONTROL (cont'd)

maintaining records of such rework and/or replacement. Such records will be available for RSCM-PAD review as required.

3. Preventative Maintenance

The Test Operations Division will provide for preventative maintenance work, control, and acceptance criteria. Records and control will be maintained by the Test Operations Division with appropriate surveillance by RSCM-PAD.

4. Functional Test

Functional tests of Test stand equipment prior to engine or component testing will be controlled by the Test Operations Division.

5. Cleanliness Control

Cleanliness control of test stand equipment including liquid or gaseous materials will be controlled by the Test Operations Division in conformance with the requirements of the Test Request and the documents referenced therein.

6. Calibration

Calibration will be controlled by the Test Instrumentation Division with approval of the Measurements Standards Operations Department of Quality Control-Support Operations, Reference Section IX.